FINAL REPORT
Grant No. NCC 3-336
July 1994 --- February 1995

Bearing Lubrication Analysis Counter-Rotating Apparatus Data Acquisition System

by

Donald J. Anthan
Engineering Technology Department
Cleveland State University
1983 East 24th Street
Cleveland, Ohio 44115

The NASA Tribology department has a test rig to test ball bearing materials under minimal lubrication ("parched bearing" rig). The test rig hardware, electronics, & software data acquisition system were not functioning properly. The motor drives for the test rig were 1970 vintage. The interface electronics and signal conditioning were of the "breadboard, prototype" variety and the data acquisition computer program was a custom QBASIC program without graphics & standard I/O drivers. NASA requested that a new control scheme - hardware, electronics, and software - be developed to re-commission the test rig.

The new technology implemented into the new test rig control scheme consisted of:

1. New, state-of-the-art AC variable speed drives for controlling speeds of the inner and outer raceways.

2. Standard, "off-the-shelf" electronics packages to signal condition the control parameters being measured - speed, ball spin, ball position, temperatures, and torque.

3. The closed loop control on the outer raceway speed was accomplished through a PID module which developed a speed correction signal based on the ball position error.

4. The data acquisition system for the computer was developed using National Instruments LABVIEW for Windows. This software package is state-of-the-art, Windows-based.

The major benefits from this effort were not of the "unique or novel" nature. The two (2) major benefits were:

1. Using "state-of-the-art", "Off-the-shelf" hardware, this effort opened a "whole new world" to NASA personnel as far as electronics vendors and the methods to use available literature to investigate and contract these companies.

2. This was the first application for National Instruments LABVIEW for Windows software. Because of its success and exposure on this project, this software package has become the "standard" for data acquisition at NASA.